# Improvements relating to the manufacture of motor vehicle bumper bars


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Abstract of **GB925956**

925,956. Making bumper bars. JOSEPH SANKEY & SONS Ltd. July 3, 1961 [Sept. 27, 1960], No. 33086/60. Drawings to Specification. Class 83 (2). A method of making a bumper bar for a motor vehicle comprises forming an aluminium alloy sheet clad with pure aluminium into a bumper bar, subjecting said bar to artificial ageing consisting of precipitation heat treatment to cause the required strength to be imparted to the bar and thereafter bright anodizing the aluminium cladding. In an example, a bumper bar is pressed from a fully annealed clad aluminium sheet, trimmed and pierced, attached to a jig to prevent distortion and solution heat treated at 520 C. for 20 minutes and precipitation heat treated at 195 C. for 2 to 3 hours. The bar is finally mechanically polished, chemically brightened and anodized to a maximum depth of 0.007 mm. and the anodic film sealed by steam or hot water. A resin-type lubricant may be used during pressing. The bar may be formed by rolling. The preferred thickness of the cladding when applied to one side of a sheet only is 7.5 to 10% of the total thickness of the material. Hub discs and overriders may also be made by the method.

# PATENT SPECIFICATION

925,956

925,956

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COMPLETE SPECIFICATION

NO DRAWINGS

## Improvements relating to the Manufacture of Motor Vehicle Bumper Bars

WE, JOSEPH SANKEY & SONS LIMITED, a British Company, of Albert Street, Bilston, Staffordshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the manufacture of motor vehicle bumper bars.

Motor vehicle bumper bars have hitherto in many instances been made of chromium-plated mild steel, but such plated steel bars suffer from the disadvantage that they are somewhat heavy in weight and are, because of the cost of plating, comparatively expensive to produce, and various proposals have been made with a view to avoiding one or both of these disadvantages.

One method which was suggested was to make bumper bars from an aluminium alloy, aged but pressed either hot or cold in a similar manner to mild steel bars, the pressed alloy being directly anodised. Unfortunately, the dull appearance of such bars after anodising would not match the appearance of chromium-plated parts of vehicles on which the bars might be used.

Another suggestion was to make bumper bars from pure aluminium so that they could be brightened and anodised to give a similar appearance to that of corresponding bars of chromium-plated steel. However, the strength of such bumper bars of anodised pure aluminium would be well below the strength of the corresponding bars made of steel.

A further proposal was to make bumper bars from an aluminium alloy which was subsequently electroplated to produce a high brightness, but such bars could not be made inexpensively because of the cost of plating.

It has also been attempted to produce satisfactory aluminium bumper bars by a casting process, but bars made by casting had the disadvantage of being too brittle and would have to be plated.

The object of the present invention is to provide bumper bars which are manufactured in such a way that the said bars can have the desired strength and surface brightness whilst being comparatively light in weight and inexpensive to produce.

According to the invention, a motor vehicle bumper bar is composed of aluminium alloy sheet clad on one or both sides with a layer of pure aluminium having a bright-anodised finish.

Also, according to the invention, in a method of manufacturing a motor vehicle bumper bar, aluminium alloy sheet clad with pure aluminium is formed into the required shape of the bumper bar, the said bar when shaped being subjected to artificial ageing consisting of precipitation heat treatment, to cause the required strength to be imparted to the bar, and the external surface of the aluminium cladding thereafter being given a bright-anodised finish.

By the expression "pure aluminium" herein used is meant aluminium having a percentage purity such that it is capable of being bright anodised.

By way of example, the following are the percentage compositions of typical aluminium alloys which, in sheet form, can be used in carrying out the invention.

| | | |
|---|---|---|
| (A) | Copper | 0.1% |
| | Magnesium | 0.3—1.5% |
| | Silicon | 0.6—1.3% |
| | Iron | 0.6% |
| | Manganese | 0.3—1.0% |
| | Titanium | 0.2% |
| | Zinc | 0.1% |
| | Chromium | 0.05% |
| | Aluminium | Remainder |

[Price

| | | |
|---|---|---|
| (B) | Copper | 3.5—5.0% |
| | Magnesium | 0.4—1.4% |
| | Silicon | 0.7% |
| | Iron | 0.7% |
| | Manganese | 0.4—1.2% |
| | Nickel | 0.2% |
| | Zinc | 0.2% |
| | Aluminium | Remainder |

The aluminium clad on the surface of the alloy sheet used in carrying out the invention has to be suitable for bright anodising, and in order to achieve this, any iron and other impurities in the aluminium used for cladding must be controlled to a limit as low as possible. The thickness of the aluminium cladding is important and if it is too large in relation to the total thickness of the clad sheet, the strength of the finished article may be too low. If, on the other hand the aluminium cladding is too thin the brightness of the finished article may be adversely affected. Preferably, the thickness of the aluminium cladding is, in the case where the alloy sheet is clad on one side only, between 7½% and 10% of the total thickness of material.

Excessive heat treatment before polishing, or excessive mechanical polishing, may lead to loss of brightness in the finished article.

The bumper bar can be shaped by a pressing operation, but in the case where the bumper bar is shaped by a pressing operation requiring comparatively severe draw, either it should be arranged that the clad alloy sheet is in a fully-annealed condition when subjected to the pressing operation, or it should be arranged that the shaping is carried out by hot pressing the clad alloy sheet, the operation of hot pressing being followed by quenching of the article from the critical temperature. When, on the other hand bars of similar shape, requiring less severe draw, are required to be pressed, the pressing operation can be carried out with the clad alloy sheet in a solution heat-treated condition, instead of the clad alloy sheet being fully annealed before pressing or instead of carrying out the operation of hot pressing followed by quenching.

When forming by pressing bumper bars which are of a shape requiring comparatively severe draw, it is advantageous to lubricate only the die side of the clad sheet forming the blank from which the bar is pressed. In order to reduce the possibility of marks such as score marks or scratches being formed, the resin type of lubricant is found to be most suitable for effecting such lubrication.

If the shaped bar is formed by a pressing operation on fully annealed clad alloy sheet, or by a hot pressing operation, it is subjected after shaping to solution heat treatment, followed by the precipitation heat treatment, a suitable jig being used, during the solution heat treatment of the shaped bar, so as to prevent distortion of the bar. If, on the other hand, the shaped bar is formed from clad alloy sheet which is in a solution heat-treated condition at the time of pressing the step of solution heat-treatment of the shaped bar is not required, although the step of precipitation heat treatment of the shaped bar is still carried out.

When solution heat treatment of the shaped bar is applicable, it is essential that the temperature and the time of treatment be suitably chosen, having regard to the fact that if the temperature is too high and/or the time too long, diffusion of certain ingredients from the alloy into the aluminium cladding can occur and can result in the finished appearance of the bar being spoilt upon carrying out the anodising. A temperature of 520°C and a treatment time of 20 minutes are found to be the most suitable temperature and time in the case of solution heat treatment of the bumper bars.

With regard to the precipitation heat treatment of the shaped bar, it is found suitable for this latter treatment to be carried out at a temperature of 195°C for a time of from 2 to 3 hours, depending upon the thickness of the material, so as to impart the required strength to the bar.

If the polishing of the bar is effected mechanically, such polishing should be kept to a minimum, since if there is excessive removal of surface material during the polishing, the alloy beneath the cladding may be exposed and this may result in one or more localised portions of the bar being of a dull appearance after anodising. If a very high surface brightness and reflectability is required, the bar can be subjected to chemical brightening, or electro-brightening, after mechanical polishing.

The anodising operation, carried out after the polishing, improves the resistance to corrosion. The thickness of the anodic film should preferably not exceed 0.007 mm., otherwise the reflectability and total brightness may be reduced.

Sealing of the bright anodised surface, to render the anodic film impervious, can be carried out by the use of either steam or hot water.

Instead of the alloys hereinbefore specified, by way of example, at (A) and (B), other aluminium alloys may be used if desired, but sheets made from such other alloys must be suitable for cladding with pure aluminium and must be of sufficient strength to suit the bar required.

By way of example, a particular method of carrying out the invention will now be described in connection with the manufacture of a motor vehicle bumper bar.

*EXAMPLE*

In this example, there is used a fully-

annealed clad aluminium alloy sheet wherein the composition of the alloy is that hereinbefore set out at (A), the cladding of the sheet being pure aluminium. This annealed clad alloy sheet is first shaped in a press to the required shape of the bumper bar, using a resin type of lubricant between the die and the sheet, and the shaped bar is next trimmed and pierced. The bar is then placed in an enforced air circulation furnace and subjected for 20 minutes to solution heat treatment at a temperature of 520°C, a jig being used to prevent distortion of the bar, and the bar is thereafter subjected to precipitation heat treatment, to cause it to age, the precipiation heat treatment being carried out in a suitable furnace at a temperature of 195°C for 2 to 3 hours. After the precipitation heat treatment, the bar is mechanically polished and chemically brightened, and is then subjected to anodising, the thickness of the anodic film not exceeding 0.007 mm, and the anodic film being sealed by exposing the bar to steam or hot water.

Bumper bars manufactured in accordance with the invention have a strength and surface brightness similar to that of corresponding bars of electroplated mild steel, but are advantageously lighter in weight, and less expensive to produce, than such plated steel bars.

If desired, the manufacture of bumper bars in accordance with the invention may, in suitable cases where the bars are to be of a symmetrical shape, be carried out by rolling the clad alloy sheet into the shape of the bar, ageing the rolled bar by precipitation heat treatment, and then bright-anodising the pure aluminium cladding, the clad alloy sheet being solution heat-treated at an appropriate stage before the ageing treatment. The rolling can, in cases not requiring comparatively severe draw, be carried out when the clad alloy sheet is in a solution heat-treated condition, but in cases requiring comparatively severe draw the rolling is carried out with the sheet in an annealed condition and the solution heat-treatment is carried out on the rolled bar. The degree of draw feasible if the clad alloy sheet is shaped when in a solution heat-treated condition tends to be greater when the shaping is effected by a rolling operation than when the shaping is effected by a pressing operation. In certain cases requiring quite severe draw, therefore, the shaping may advantageously be effected by rolling the material when in a solution heat-treated condition, instead of by a pressing operation which would, in such cases, require the solution heat-treatment to be carried out after shaping.

WHAT WE CLAIM IS :—

1. A motor vehicle bumper bar composed of aluminium alloy sheet clad on one or both sides with a layer of pure aluminium having a bright-anodised finish.

2. A method of manufacturing a motor vehicle bumper bar, wherein aluminium alloy sheet clad with pure aluminium is formed into the required shape of the bumper bar, the said bar when shaped being subjected to artificial ageing consisting of precipitation heat treatment, to cause the required strength to be imparted to the bar, and the external surface of the aluminium cladding thereafter being given a bright-anodised finish.

3. A method of manufacturing a motor vehicle bumper bar, as claimed in claim 2, wherein the shaping of the bar is carried out by a pressing operation.

4. A method of manufacturing a motor vehicle bumper bar, as claimed in claim 2, wherein the shaping of the bar is carried out by a rolling operation.

5. A method of manufacturing a motor vehicle bumper bar, as claimed in claim 3, wherein the clad aluminium alloy sheet is shaped by a pressing operation when in an annealed condition and is then subjected to solution heat treatment before being artificially aged.

6. A method of manufacturing a motor vehicle bumper bar, as claimed in claim 3, wherein the clad aluminium alloy sheet is shaped by a hot pressing operation which is followed by quenching of the bar from the critical temperature, the bar when quenched being subjected to solution heat treatment before being artificially aged.

7. A method of manufacturing a motor vehicle bumper bar, as claimed in claim 4, wherein the clad aluminium alloy sheet is shaped by a rolling operation when in an annealed condition and is then subjected to solution heat treatment before being artificially aged.

8. A method of manufacturing a motor vehicle bumper bar, as claimed in claim 3, wherein the clad aluminium alloy sheet is pressed when in a solution heat-treated condition.

9. A method of manufacturing a motor vehicle bumper bar, as claimed in claim 4, wherein the clad aluminium alloy sheet is rolled when in a solution heat-treated condition.

10. A method of manufacturing a motor vehicle bumper bar substantially as herein described with reference to the foregoing Example.

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